CLAIMS

1. A torsional vibration measuring instrument comprising:

a plurality of reflecting means arranged with stipulated intervals therebetween along surface of a rotator of which torsional vibration is to be measured;

a pulse light irradiating means for irradiating a repetitive pulse light beam to the plurality of reflecting means;

an outgoing-transmitting means for transmitting the irradiated pulse light beam;

a plurality of transmitting-receiving means for irradiating the transmitted pulse light beam to the plurality of reflecting means, and for receiving plurality of reflected pulse light beams which have been reflected by the plurality of reflecting means;

an incoming-transmitting means for transmitting the plurality of reflected pulse light beams which have been received;

a plurality of detecting means for detecting the plurality of reflected pulse light beams which have been transmitted by the incoming-transmitting means; and

a signal processing means for processing a plurality of pulse output signals which have been outputted from the plurality of detecting means and for calculating torsional vibration frequency of the rotator to be measured.

2. The torsional vibration measuring instrument of Claim 1 characterized that the pulse light beam irradiating means can irradiate pulse light beam with variable pulse repetitive frequency and with variable pulse time width.

3. The torsional vibration measuring instrument of Claim 1 characterized that the pulse light beam irradiating means includes a plurality of separated units each corresponding to one of the plurality of transmitting-receiving means.

4. The torsional vibration measuring instrument of Claim 1 characterized that the ongoing-transmitting means includes a beam splitter for splitting the pulse light irradiated from the pulse light irradiating means and for transmitting the pulse light.

5. The torsional vibration measuring instrument of Claim 1 characterized that the plurality of reflecting means and the plurality of transmitting-receiving means are aligned in radial direction of the rotator to be measured, and that the pulse light beams are directed so that the pulse light beam is irradiated substantially perpendicular to the plurality of reflector means.

6. The torsional vibration measuring instrument of Claim 1 characterized that the outgoing-transmission means and the incoming transmission means have at least one light dividing means, and that the outgoing-transmission means and the incoming transmission means utilize at least partly a common light guide.

7. The torsional vibration measuring instrument of Claim 1 characterized that the signal processing means calculate torsional vibration frequency of the rotator based upon difference of rotational periods obtained by the corresponding pulse output signals.

8. The torsional vibration measuring instrument of Claim 1 characterized that the transmitting-receiving means are arranged in peripheral direction of the rotator to be measured.

9. The torsional vibration measuring instrument of Claim 1 characterized that at least three transmitting-receiving means and at least three reflecting means are arranged along axial direction of the rotator.

10. The torsional vibration measuring instrument of Claim 1 characterized that the reflecting means has a high reflection region where the light beam is reflected with a high

reflection coefficient, and a low reflection region where the light beam is reflected with a reflection coefficient lower than the high reflection coefficient, and that the high reflection region and the low reflection region are distributed along peripheral direction of the rotator to be measured.

11. The torsional vibration measuring instrument of Claim 1 characterized that the plurality of reflecting means each includes a plurality of units of reflecting means attached on the rotator to be measured.

12. The torsional vibration measuring instrument of Claim 1 characterized that the signal processing means calculates the torsional vibration frequency of the rotator to be measured, by differentiating the plurality of pulse output signals which are outputted from the plurality of detecting means.

13. The torsional vibration measuring instrument of Claim 1 characterized that the signal processing means calculates the torsional vibration frequency of the rotator to be measured, by digital counting of the plurality of pulse output signal which are outputted from the plurality of detecting means.

14. The torsional vibration measuring instrument of

Claim 1 characterized that the signal processing means calculates the torsional vibration frequency of the rotator to be measured, using lengths of the plurality of reflecting means in peripheral direction.

15. The torsional vibration measuring instrument of Claim 1 characterized that wavelength of pulse light of the pulse irradiating means can be changed.

16. The torsional vibration measuring instrument of Claim 1 characterized that the detecting means include wavelength selecting means for selecting the reflected pulse light beam using the wavelength and for detecting the selected pulse light beam.

17. The torsional vibration measuring instrument of Claim 1 characterized that size of the pulse light beam which is irradiated to the reflecting means is much smaller than lengths of the reflecting means in axial and peripheral directions of the rotator to be measured.